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DIAGNOSTIC KEY TO THE PARASITES OF SOME MARINE MAMMALS

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NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is a diagnostic key for identification of the parasites of marine mammals used by the Navy. Photographs or drawings of each parasite are presented to assist the veterinarian or technician in confirming the parasite species.		

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INTRODUCTION

This key includes only those parasites reported from the following marine mammal species:

Atlantic bottlenose dolphin (*Tursiops truncatus*)

Pacific bottlenose dolphin (*Tursiops truncatus*)

Beluga whale (*Delphinapterus leucas*)

California sea lion (*Zalophus californianus*)

Northern fur seal (*Callorhinus ursinus*)

It is written to be used by a veterinary diagnostician as well as a technician in routine identification of ova, larvae, and adult parasites found in smears or recovered during necropsies of these marine mammal species.

Materials for the figures were taken from original material when available. Unavailable specimens were adapted from Delyamure, 1955, Israel Program for Scientific Translations Ltd., 1968, and the Journal of Parasitology. In those few cases where material was not available in any form the figure has been omitted.

USE OF THE KEY

The key is divided into four parts to facilitate identification of parasites from the marine mammal species included:

- a. Larval Stages of Cetacean Parasites
- b. Adult Parasites from Cetaceans
- c. Larval Stages and Arthropod Parasites of Pinnipeds
- d. Adult Parasites from Pinnipeds

Select the appropriate section above based on the source species and the developmental stage of the parasite. Then begin with item 1 in that section, answering the question posed in the affirmative or negative. When answered affirmatively, note the number in bold face in the right-hand column of the key, which indicates the next number in the left-hand column of the key to be consulted. Continue through the key in this manner, answering questions about the size, shape or other features of the parasite until the generic name of the parasite appears in the right-hand column instead of a number. If a figure is indicated at that point, refer to it to confirm the identification.

KEY TO LARVAL STAGES OF CETACEAN PARASITES

1. Egg found in stool or blowhole 2
 Larvae found in stool or blowhole. 13
2. Egg with operculum at one end of shell. 3
 Egg with operculum 10
3. Egg oblong with single shell wall, operculum well defined. 4
 Egg oval with double shell wall, operculum poorly defined. 9
4. Host animal, Beluga whale. 5
 Host animal, Atlantic or Pacific bottlenose dolphin 6
5. Egg 0.100-0.120 mm long X 0.060 mm wide
 *Odhnieriella* sp. (figure 1)
 Egg 0.091-0.100 mm long X 0.054-0.058 mm wide
 *Orthosplanchnus* sp.
 Egg 0.072-0.092 mm long X 0.033-0.037 mm wide
 *Leucasiella artica*
6. Egg triangular in polar view. *Nasitrema* sp. (figure 2)
 Egg round in polar view. 7
7. Egg exceptionally large 0.160-0.170 mm long.
 *Braunina cordiformis* (figure 3)
 Egg not as above 8
8. Egg 0.056 mm long X 0.033 mm wide
 *Synthesium tursionis* (figure 4)
 Egg 0.068-0.079 mm long X 0.043-0.052 mm wide
 *Zalophotrema hepaticum* (figure 5)
9. Egg thick shelled, 0.040-0.060 mm long X 0.040-0.042 mm wide.
 *Diphyllbothrium* sp.
10. Egg spindle shaped, middle shell drawn out to poles
 *Corynosoma* sp. (figure 6)
 Egg not spindle shaped 11
11. Egg thick shelled, containing coiled larva *Crassicauda* sp. (figure 7)
 Egg not containing coiled larvae 12
12. Egg 0.050 mm long X 0.040 mm wide *Anisakis* sp. (figure 8)
 Egg 0.042 mm long X 0.026 mm wide *Otophocaenurus oserskoi*
13. Larvae 0.250-0.260 mm long. *Stenurus* sp. (figure 9)
 Larvae 0.260-0.285 mm long. *Halocercus* sp. (figure 10)

KEY TO ADULT PARASITES FROM CETACEANS

1. Parasite dorso-ventrally flattened, not segmented, with two suckers 2
 - Parasites not as above 7
2. Host animal, Atlantic bottlenose dolphin 3
 - Host animal, Beluga whale. 5
3. Parasite body, short, thick, from stomach. *Braunina cordiformis* (figure 11)
 - Parasite not as above 4
4. Parasite body flat, leaf-like, 11-13 mm long, from biliary system of liver
 - *Zalophotrema hepaticum* (figure 12)
 - Parasite body flat, eggs triangular in cross section, from head sinuses
 - *Nasitrema* sp. (figure 13)
 - Parasite body not leaf-like, elongate, from intestine
 - *Synthesium tursionis* (figure 14)
5. Parasite with oral sucker terminal, testes lobate in posterior 1/3 of body
 - *Orthosplanchnus* sp. (figure 15)
 - Parasite with oral sucker sub-terminal, testes smooth, in anterior 1/3 of body
 - 6
6. Parasite large, 27-60 mm long, intestine H shaped.
 - *Odhneriella seymouri* (figure 16)
 - Parasite small, 8-13 mm long, intestine not as above.
 - *Leucasiella* sp. (figure 17)
7. Parasite dorso-ventrally flattened with head (scolex) and segmented body
 - *Diphyllbothrium* sp. (figures 18 a,b)
 - Parasite not as above. 8
8. Body of parasite round with no obvious head or tail structure 9
 - Body of parasite with hind and fore body regions. 14
9. Parasite from stomach or intestine 10
 - Parasite found from other than above regions. 11
10. Adult worms large (over 60 mm). *Anisakis simplex* (figures 19, a,b,c)
 - Adult worms small (under 60mm). *Porrocaecum decipiens* (figures 20 a,b)
11. Parasite from mammary tissue or urogenital system 12
 - Parasite not from above. 13
12. Male spicules very unequal (one shorter than other)
 - *Crassicauda crassicauda* (figure 21)
 - Male spicules equal (approximately same size)
 - *Crassicauda giliakiana* (figure 22)

13. Parasite from lungs (bronchi), large (over 80 mm).
. *Halocercus* sp. (figures 23 a,b)
Parasite from bronchi, blowhole or circulatory vessels, small (under 50 mm)
. *Stenurus* sp. (figure 24)
Parasite from auditory organ of Beluga whale
. *Otophocaenurus oserskoi* (figure 25)
14. Parasite with swollen anterior body and round hind body.
. *Corynosoma* sp. (figures 26 a,b)

KEY TO LARVAL STAGES AND ARTHROPOD PARASITES OF PINNIPEDS

1. Parasite found externally on or in skin 16
- Parasite found in blood, stool or mucus 2
2. Parasite a larval form 13
- Parasite an egg form 3
3. Egg oblong with single shell wall, operculum well defined. 4
- Egg oval with double shell wall, operculum poorly defined 7
4. Egg from California sea lion 5
- Egg from Northern fur seal 6
5. Egg oval, 0.068-0.079 mm long X 0.043-0.052 mm wide, thickened at posterior pole,
circular in cross section *Zalophotrema hepaticum* (figure 5)
- Egg slightly pear shaped, golden yellow 0.033 mm long X 0.018 mm wide.
..... *Pricitrema zalophi* (figure 27)
6. Egg oval, 0.023-0.028 mm long X 0.013-0.015 mm wide
..... *Phocitrema fusiforme*
7. Egg oval, may contain ciliated coracidium. 8
- Egg not as above 9
8. Egg thick shelled 0.069-0.072 mm long X 0.040-0.042 mm wide
..... *Diphyllbothrium pacificum*
- Egg thin shelled, 0.040-0.060 mm long X 0.038-0.042 mm wide
..... *Diplogonoporus tetraapterus*
9. Egg spindle shaped 10
- Egg not spindle shaped 11
10. Egg spindle shaped, 2 layers, middle shell drawn out to poles, 0.068-0.090 mm long
X 0.020-0.028 mm wide *Corynosoma* sp. (figure 6)
- Egg ellipsoidal, with 3 layers, 0.120-0.200 mm long X 0.027-0.030 mm wide.
..... *Bolbosoma* sp. (figure 28)
11. Egg oblong-ellipsoid, 0.135-0.138 mm long, with coiled larva
..... *Uncinaria lucasi* (figure 29)
12. Egg oval-round, embryonic material filling entire inner shell
..... *Contracaecum* sp. (figure 30)
- Egg oval-round, embryonic material not filling entire inner shell.
..... *Anisakis* sp. (figure 8)
13. Larvae in stool or mucus 14
- Larvae in blood smear 15

14. Larvae with sharp, pin-like tail, 0.000240 mm long X 0.0005 mm wide
..... *Parafilaroides decorus* (figure 31)
Larvae with tail not as above, 0.268 mm long X 0.023 mm wide
..... *Otostrongylus circumlitus* (figure 32)
15. Microfilaria 0.225-0.250 mm long X 0.0044 mm wide
..... *Dipetalonema odendhali* (figure 33)
Microfilaria 0.285-0.290 mm long X 0.0055 mm wide
..... *Dirofilaria immitis* (figure 34)
16. Parasite large, found beneath hair attached to skin
..... *Antarctophthirius microchir* (figure 35)
Parasite small, found in hair follicle of mange-like area
..... *Demodex zaloghi* (figure 36)

KEY TO ADULT PARASITES FROM PINNIPEDS

1. Parasite worm-like, either flat or round. 2
 Parasite not worm-like, with legs. 15
2. Parasite flat, not segmented, with two suckers 3
 Parasite not as above 6
3. Parasite small, anterior sucker subterminal 4
 Parasite small, anterior sucker terminal 5
4. Body pearshaped, not exceeding 0.5 mm in length, anterior sucker larger than ventral
 sucker, testes large, in posterior of body
 *Pricetrema zalophi* (figure 37)
 Body tongue shaped, exceeds 0.5 mm in length, ventral sucker larger than anterior
 sucker, testes small *Cryptocotyle jejuna* (figure 38)
5. Body cigar shaped, extends anteriorly to small terminal sucker, 1.0-1.5 mm long.
 *Phocitrema fusiforme* (figure 39)
 Body flat, leaf-like, 11-13 mm long, recovered from biliary system of liver.
 *Zalophotrema hepaticum* (figure 12)
6. Parasite flat with head (scolex) and segmented body. 7
 Parasite round, without segmentation 8
7. Each segment with a double set of genital organs
 *Diplogonoporus* sp. (figures 40 a,b)
 Each segment with a single set of genital organs
 *Diphyllbothrium* sp. (figures 18 a,b)
8. Parasite round with no obvious head or tail structure 9
 Parasite with hind and forebody, hooked proboscis organ at
 anterior end. 14
9. Parasite recovered from heart or respiratory organs. 10
 Parasite not as above 12
10. Parasite small, hair-like, from lung alveoli *Parafilaroides decorus* (figure 41)
 Parasite not as above 11
11. Parasite long, thin bodied, from fascia tissue.
 *Dipetalonema odendhali* (figures 42 a,b)
 Parasite long, tail of male in corkscrew spiral, from heart
 *Dipetalonema spirocauda* (figure 43)
12. Parasite 8-16 mm, from small intestine of pups. *Uncinaria lucasi* (figure 44)
 Parasites larger than 8-16mm, found in stomach of adults. 13
13. Adult worms, large (over 60mm), intestinal cecum absent
 *Anisakis* sp (figures 19 a,b,c)
 Worms medium sized (under 60 mm), ventricular cecum present
 *Contracaecum* sp. (figures 45 a,b)
 Worms medium sized, ventricular cecum absent *Porrocaecum* sp. (figures 20 a,b)

14. Anterior of body bulbous, posterior of body not heavily spined.
..... *Bolbosoma* sp. (figures 46 a,b)
Anterior of body hooded, body heavily spined on posterior end and trunk
..... *Corynosoma* sp. (figures 26 a,b)
15. Parasite from trachea and lungs, abdomen not elongate
..... *Orthohalarachne diminuta* (figure 47)
Parasite from nasal cavity, abdomen elongate *Orthohalarachne attenuata* (figure 48)

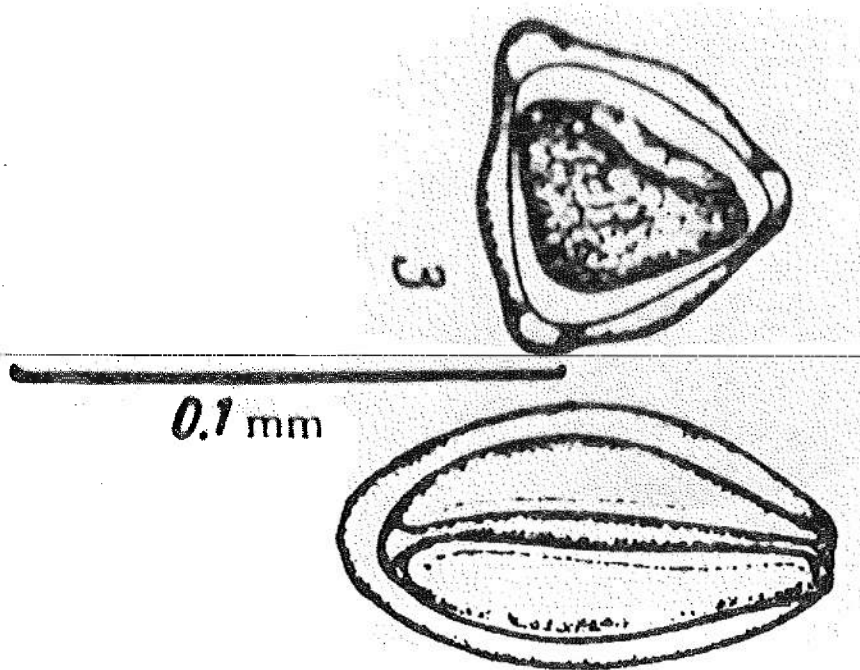


Figure 1.
Odhneriella sp. ovum
(from Delyamure, 1955)

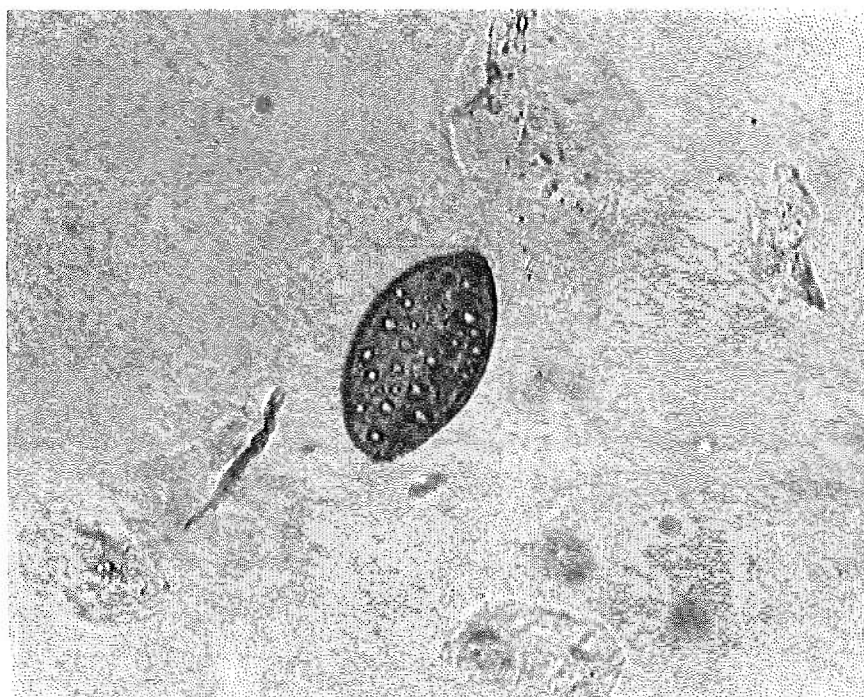


Figure 2.
Nasitrema sp. ovum

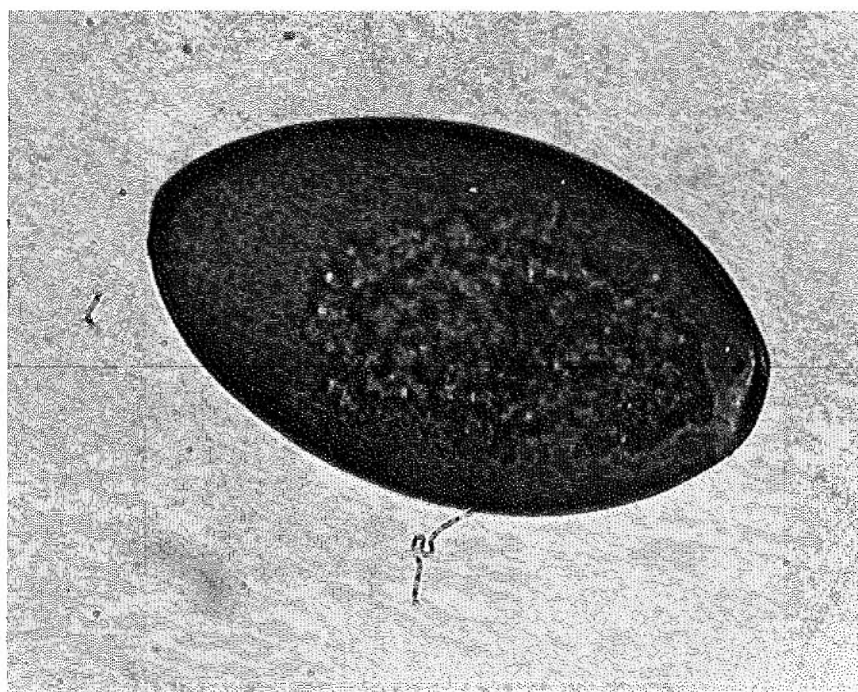


Figure 3.
Braunina cordiformis ovum

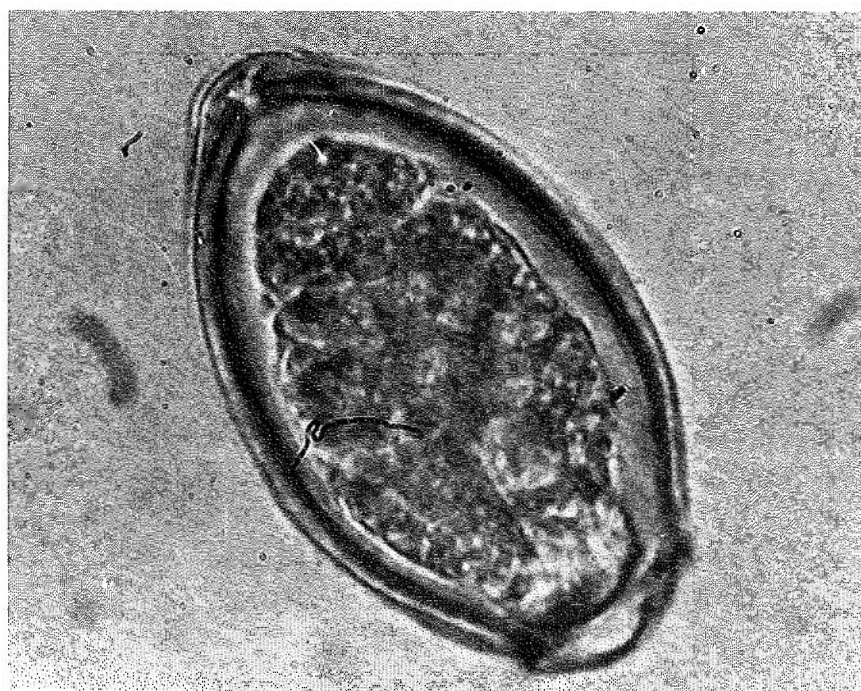


Figure 4.
Synthesium sp. ovum

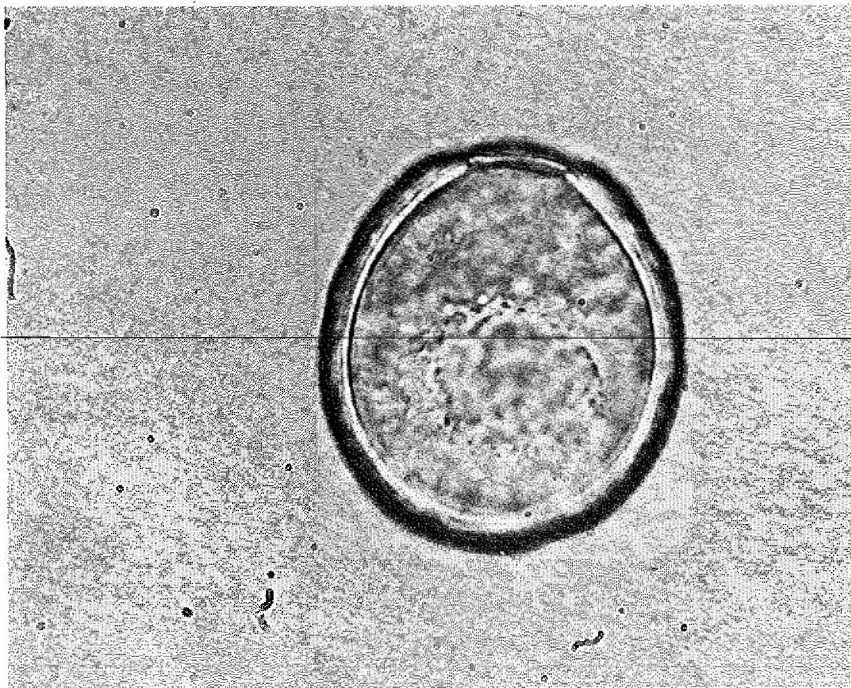


Figure 5.
Zalophotrema hepaticum
ovum

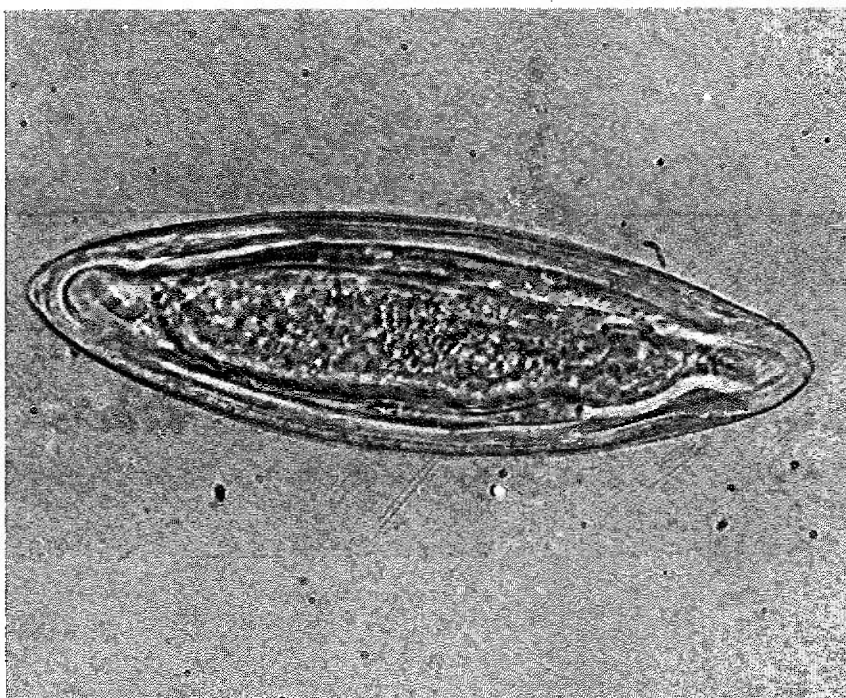


Figure 6.
Corynosoma sp. ovum

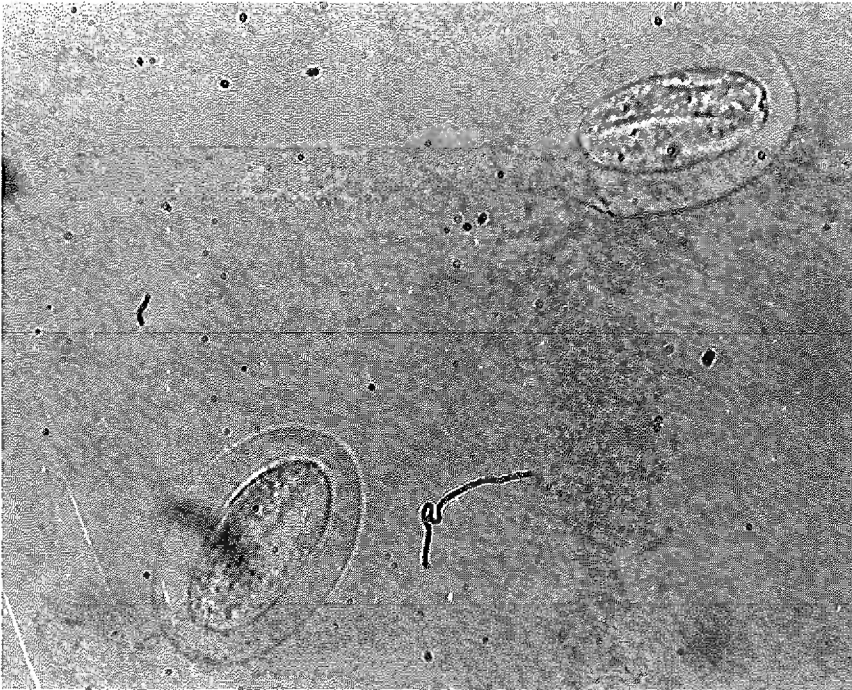


Figure 7.
Crassicauda sp. ova



Figure 8.
Anisakis sp. ova

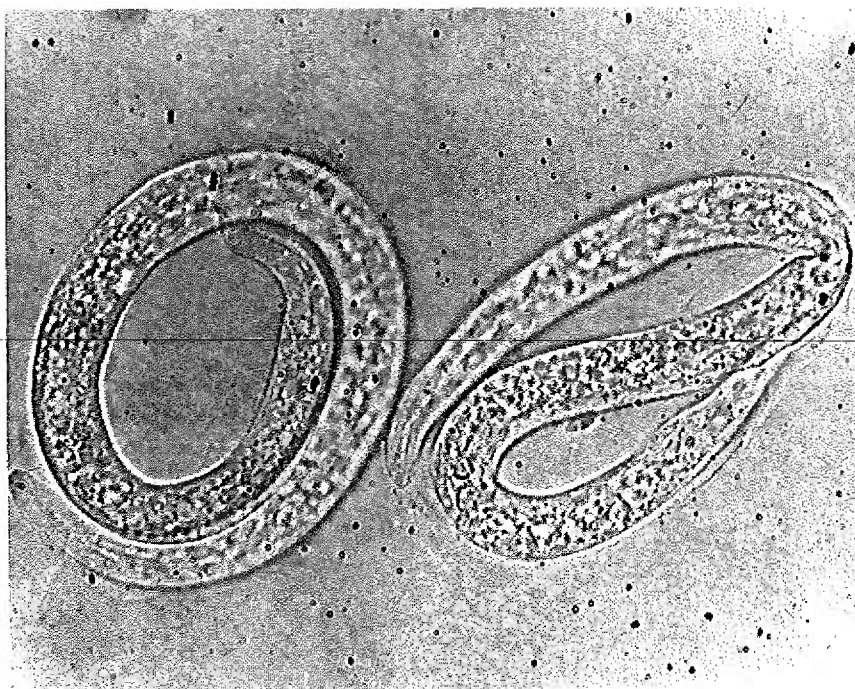


Figure 9.
Stenurus sp. larvae

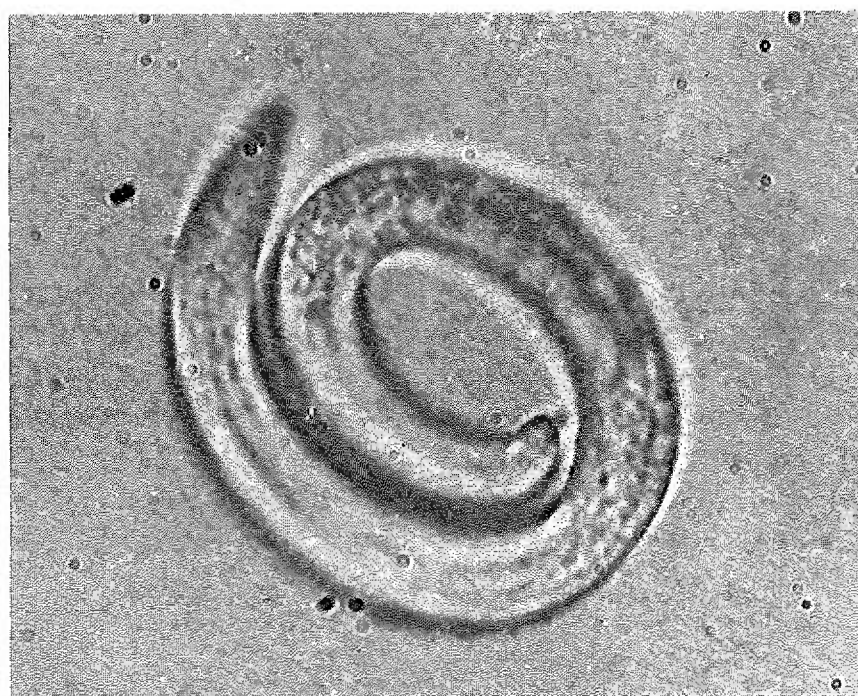


Figure 10.
Halocercus sp. larva



Figure 11.
Braumina in situ

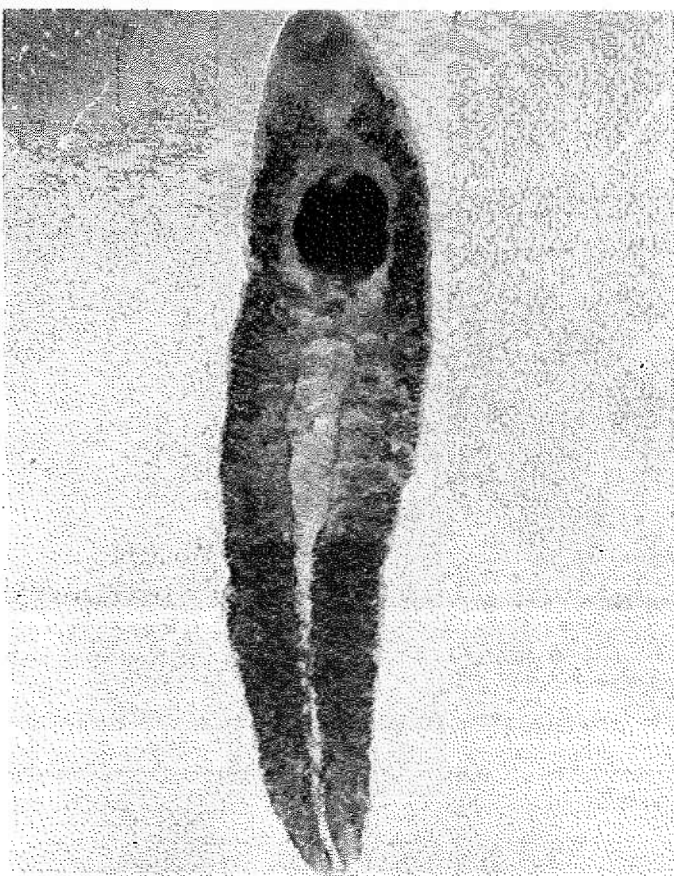


Figure 12.
Zalophotrema hepaticum

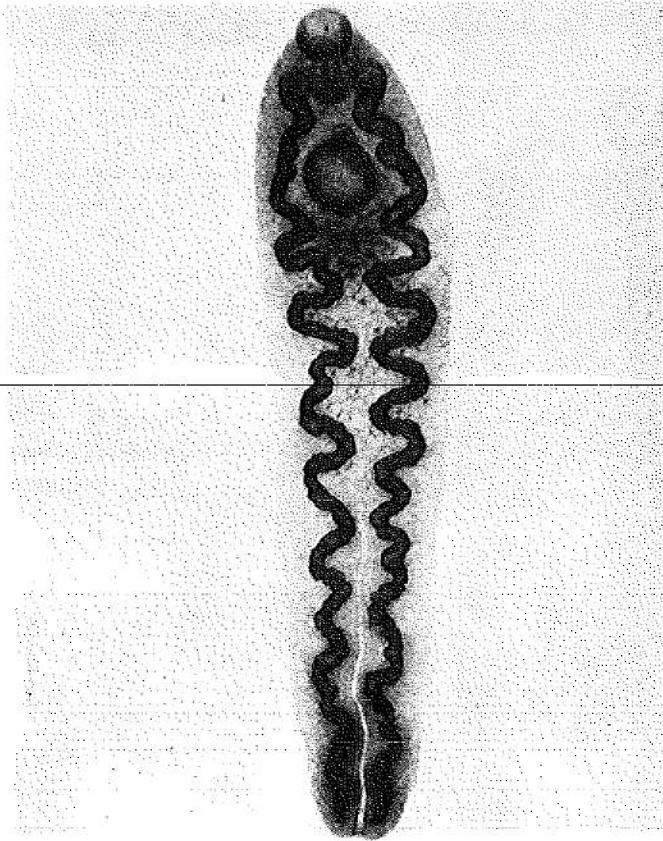


Figure 13.
Nasitrema sp.



Figure 14.
Synthesium sp.

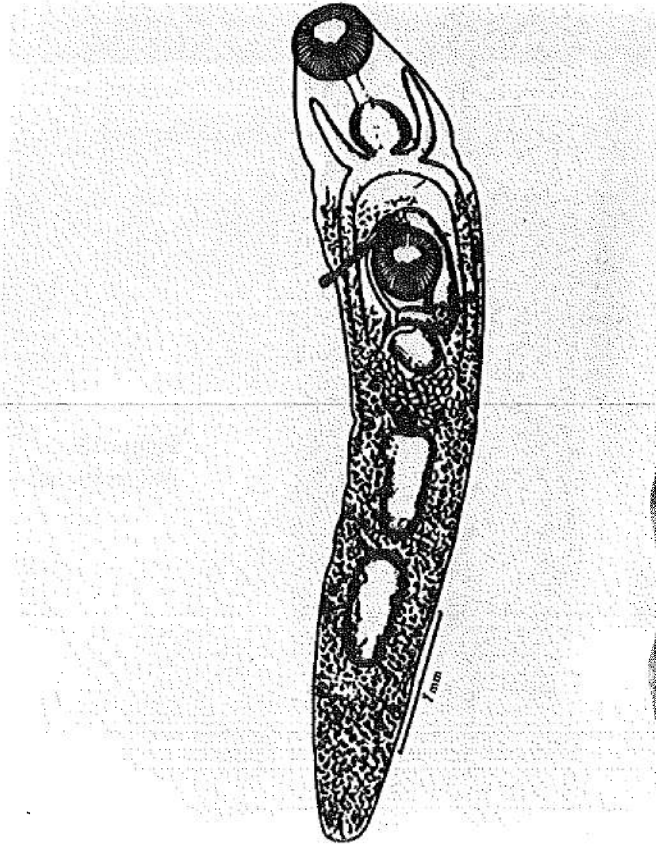


Figure 15.
Orthosplanchnus sp.
(from Delyamure, 1955)

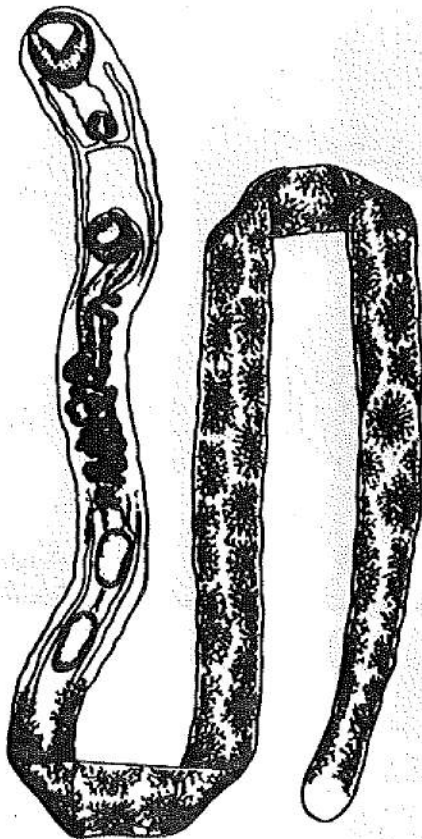


Figure 16.
Odhneriella seymouri
(from Delyamure, 1955)

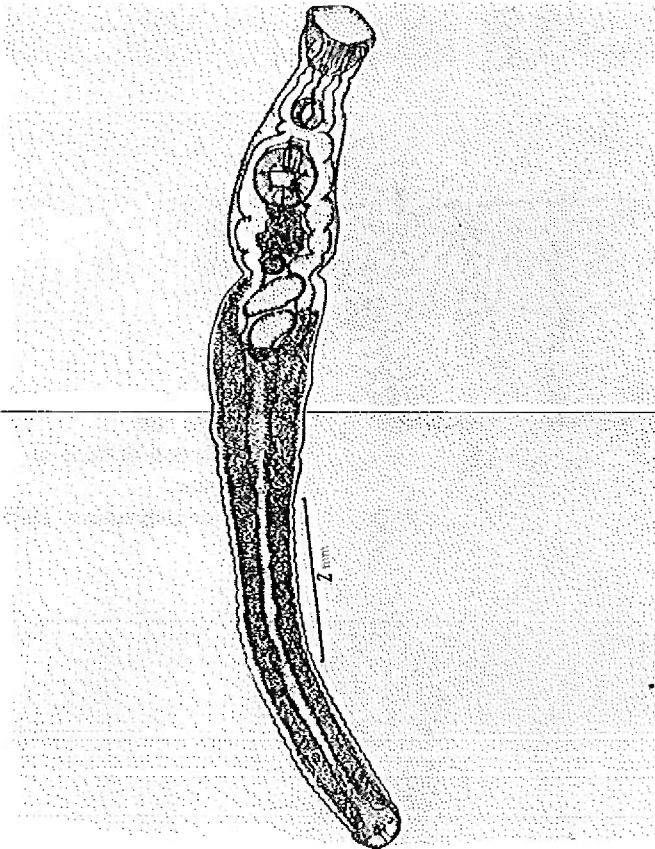


Figure 17.
Leucasiella sp.
 (from Delyamure, 1955)

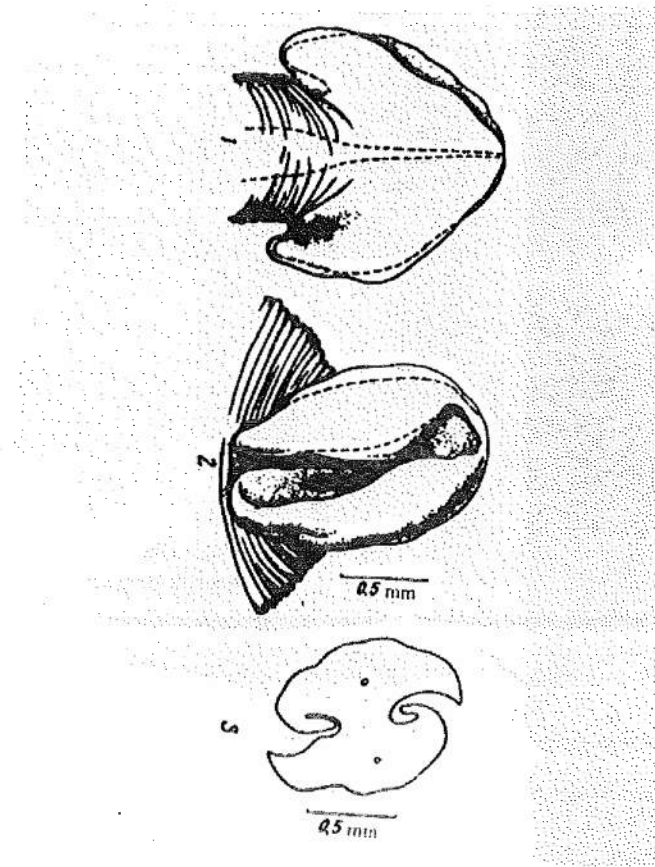


Figure 18a.
Diphyllbothrium sp.
 scolex
 (from Delyamure, 1955)

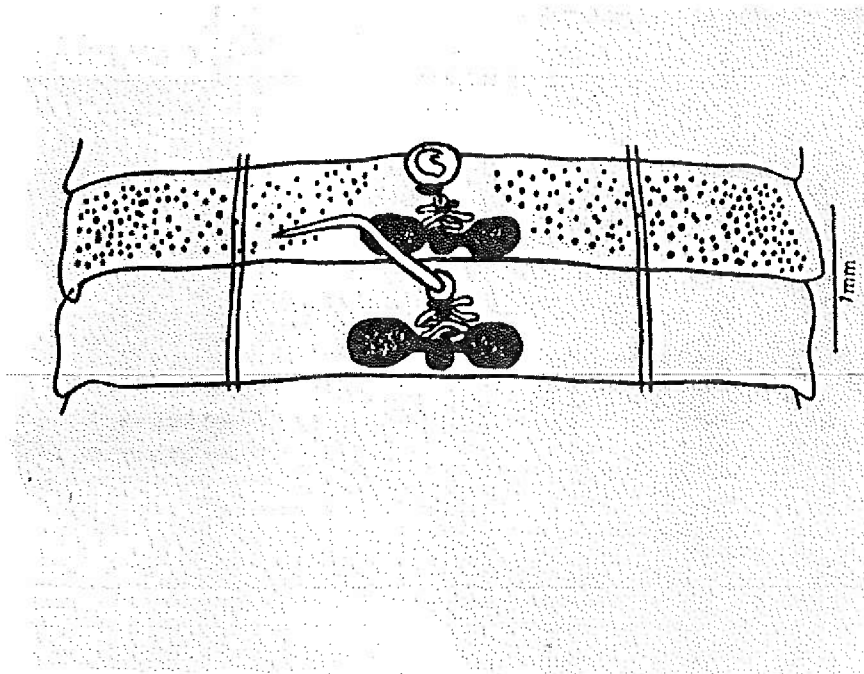


Figure 18b.
Diphylobothrium sp.
segment
(from Delyamure, 1955)

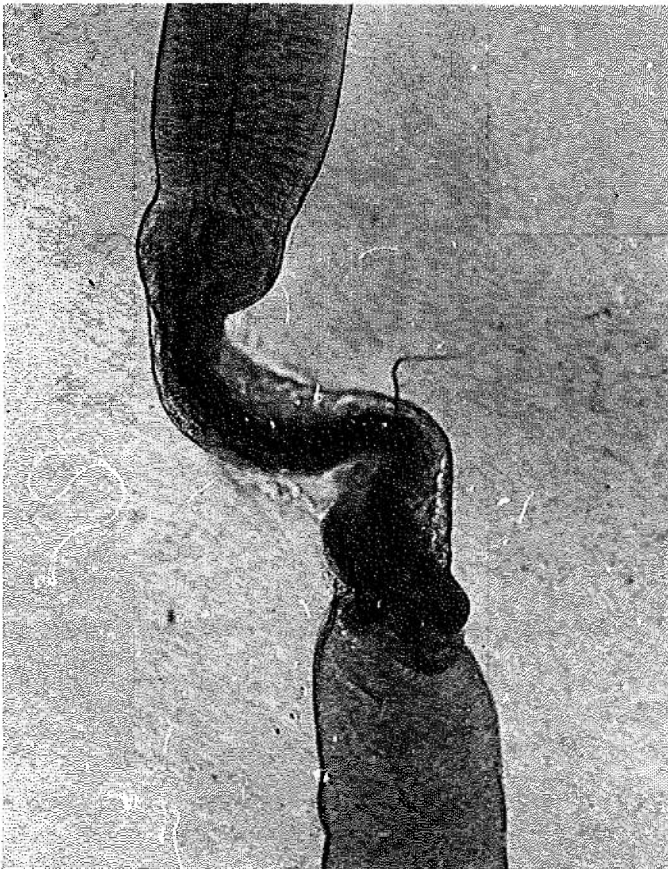


Figure 19a.
Anisakis simplex

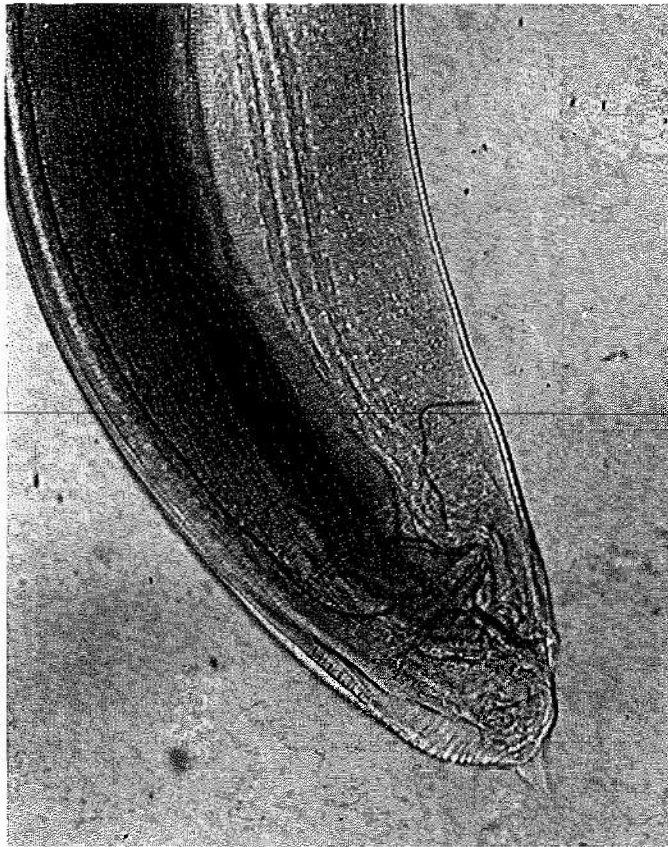


Figure 19b.
Anisakis simplex
female posterior

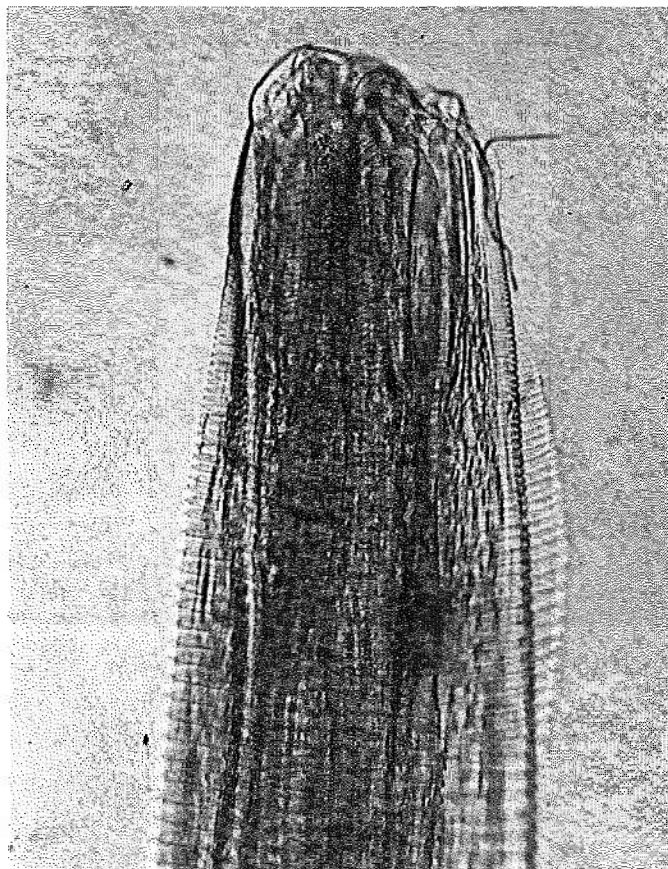


Figure 19c.
Anisakis simplex
female anterior

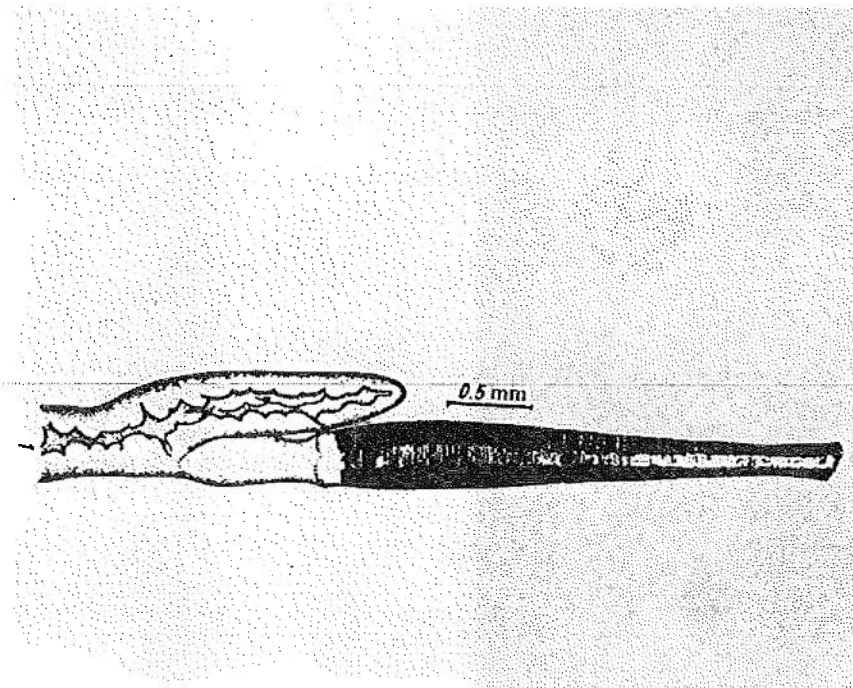


Figure 20a.
Porrocaecum decipiens
(from Delyamure, 1955)

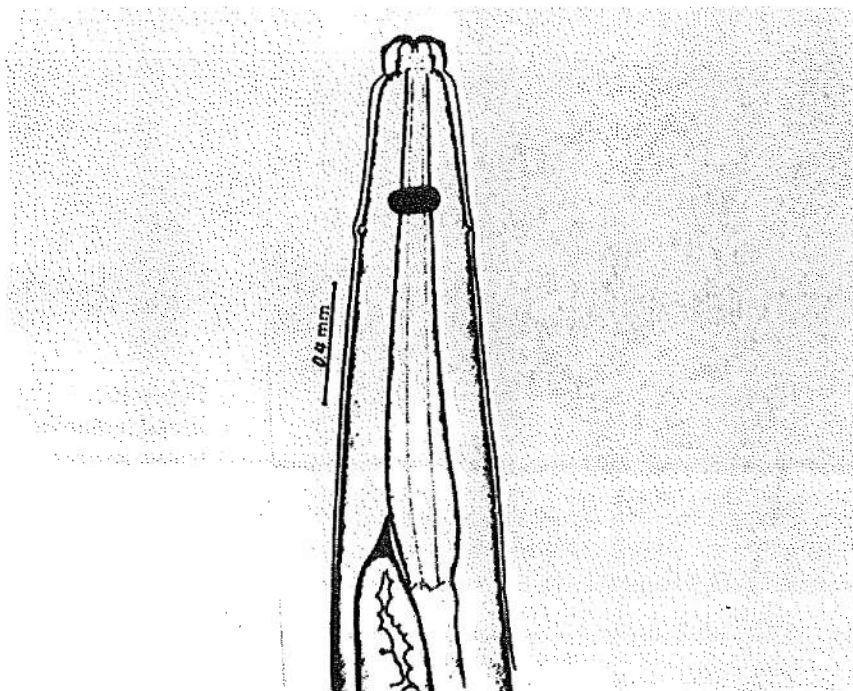


Figure 20b.
Porrocaecum decipiens
(from Delyamure, 1955)

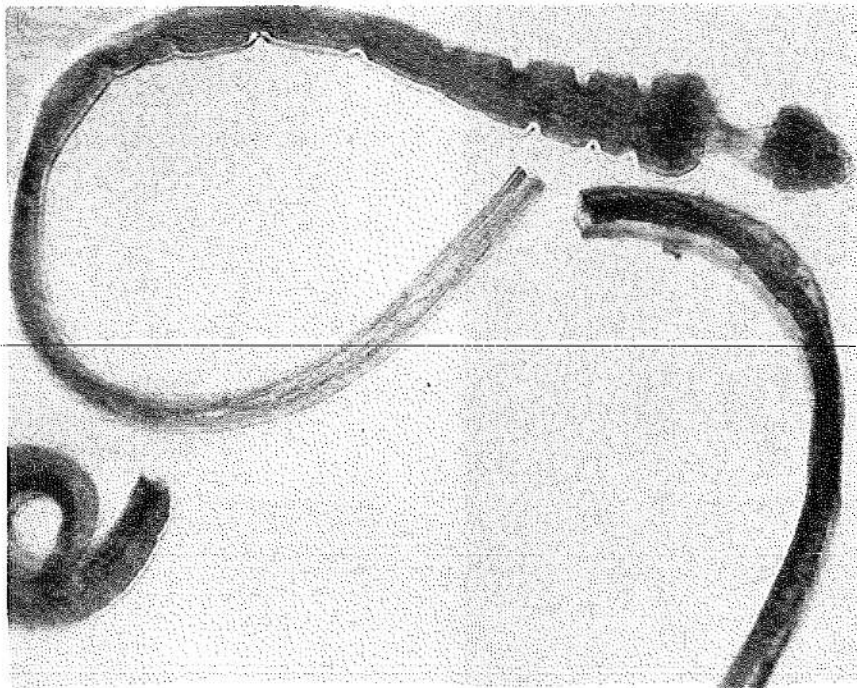


Figure 21.
Crassicauda crassicauda

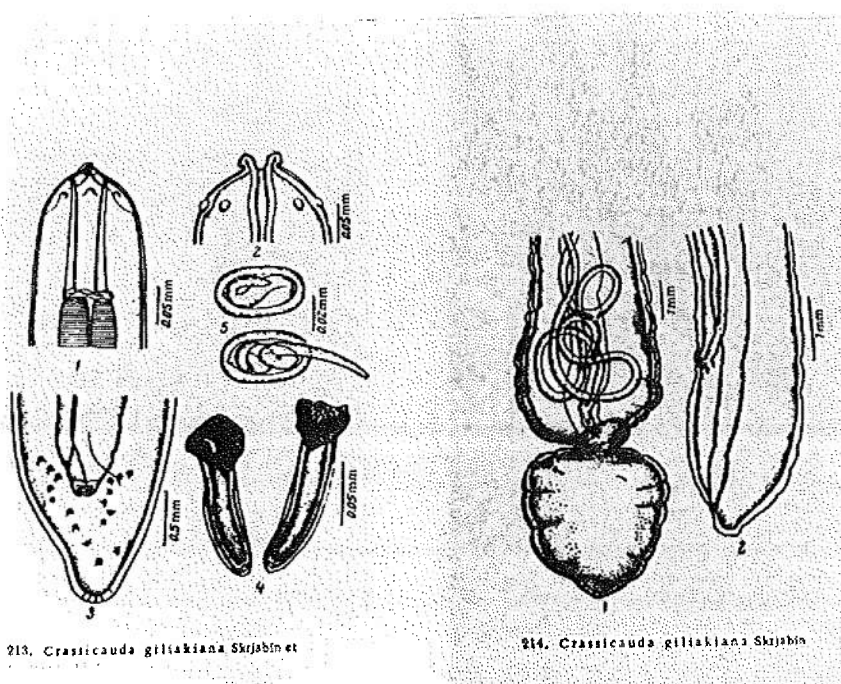


Figure 22.
Crassicauda giliakiana
(from Delyamure, 1955)

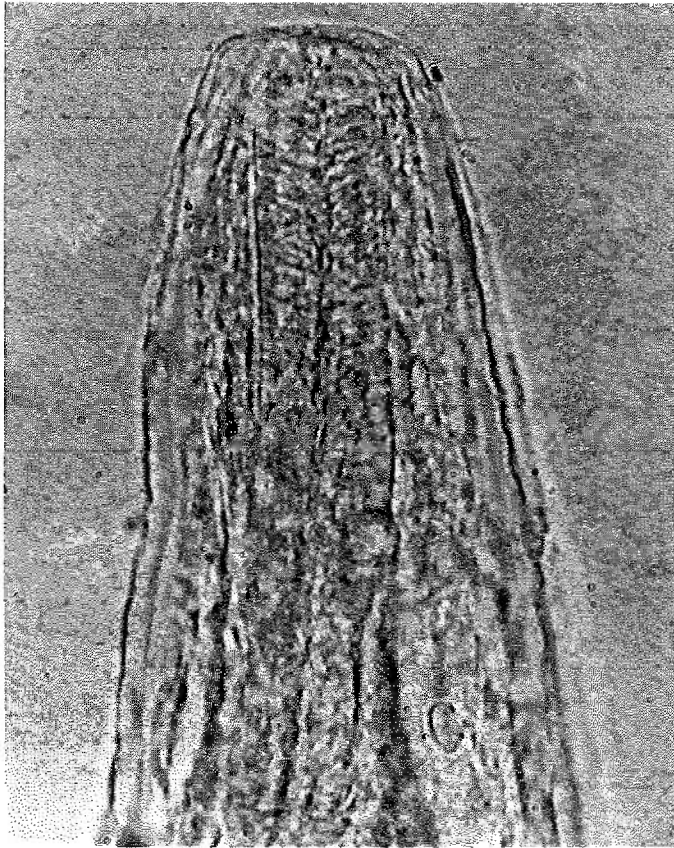


Figure 23a.
Halocercus sp.
male anterior



Figure 23b.
Halocercus sp.
male posterior

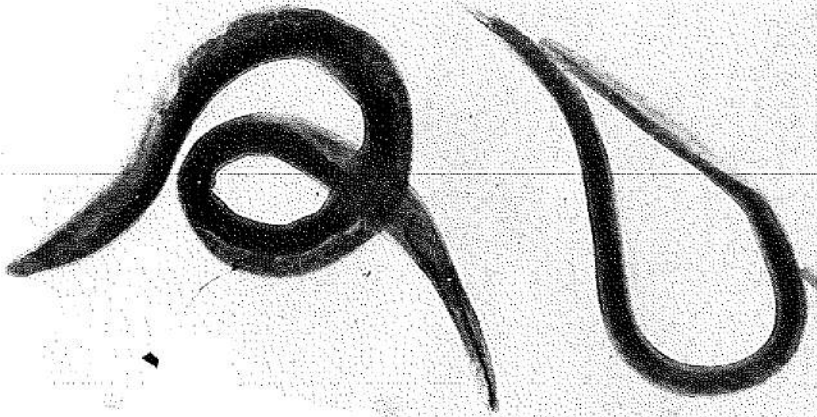


Figure 24.
Stemurus sp.

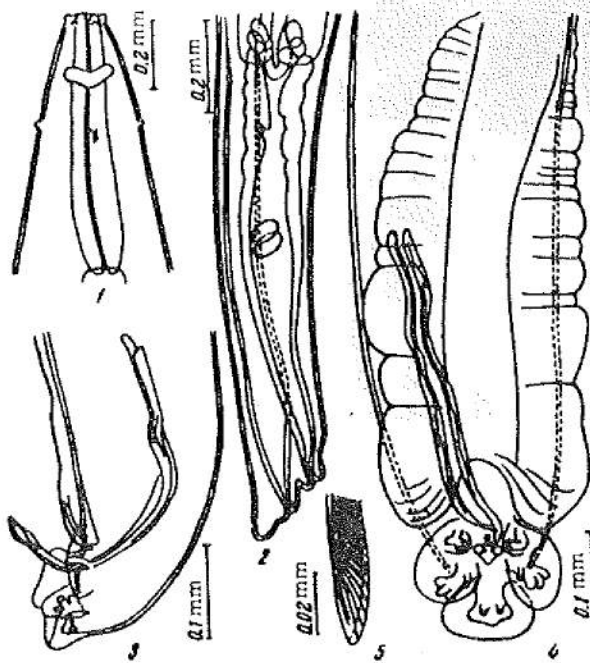


Figure 25.
Otophocaenurus oserskoi
(from Delyamure, 1955)

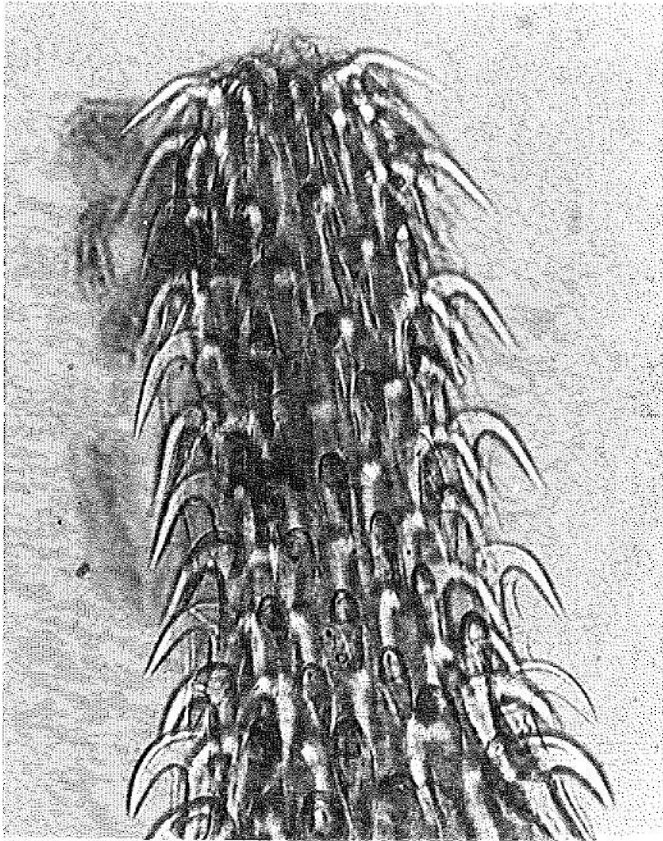


Figure 26a.
Corynosoma sp.

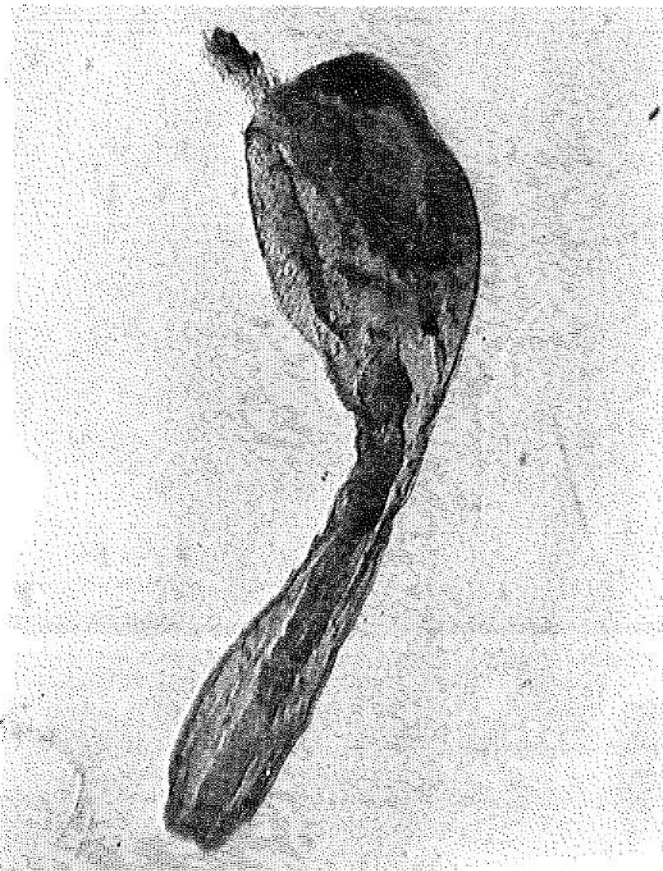


Figure 26b.
Corynosoma sp.
proboscis

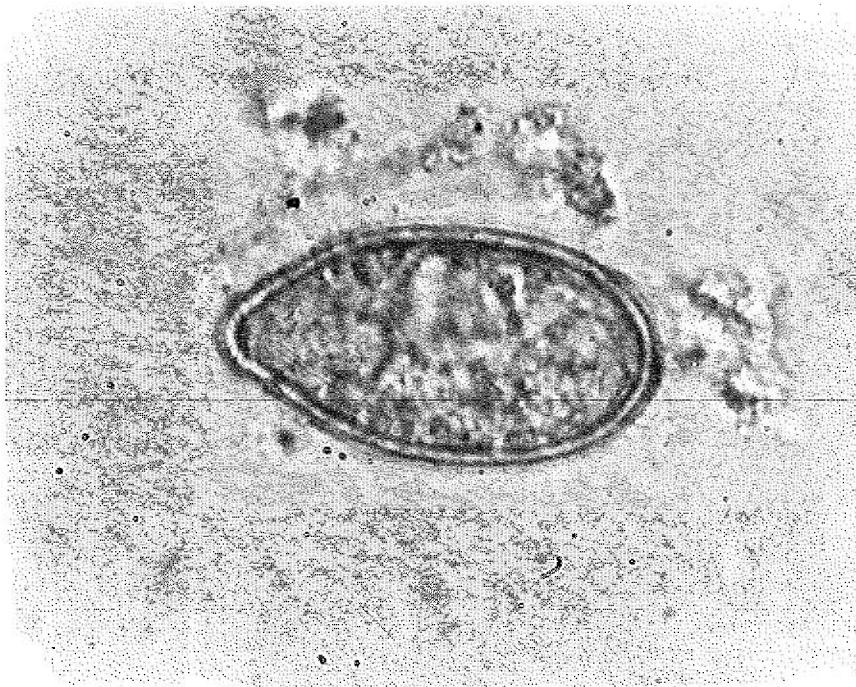


Figure 27.
Pricetremā zalophi
ovum

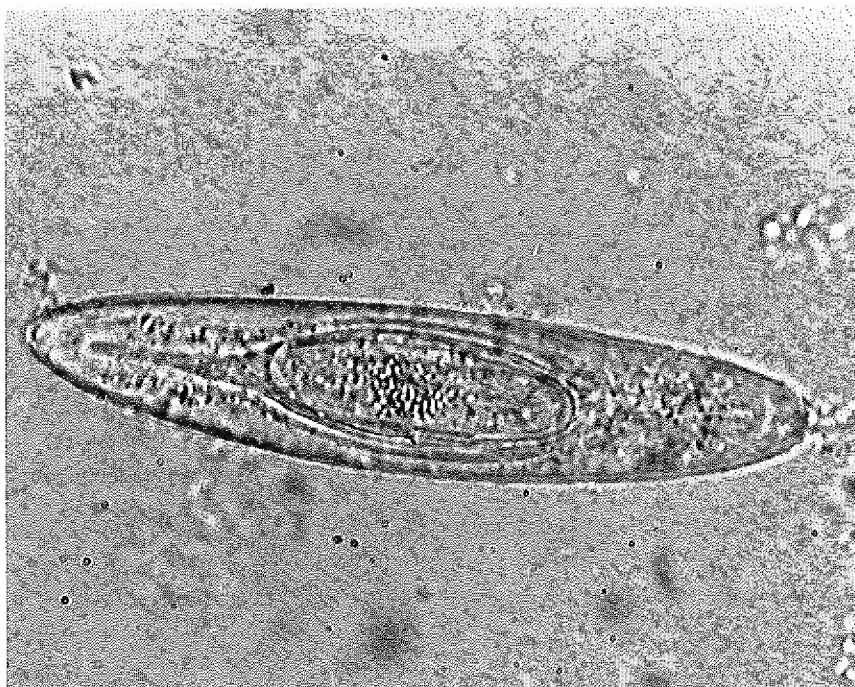


Figure 28.
Bolbosoma ovum

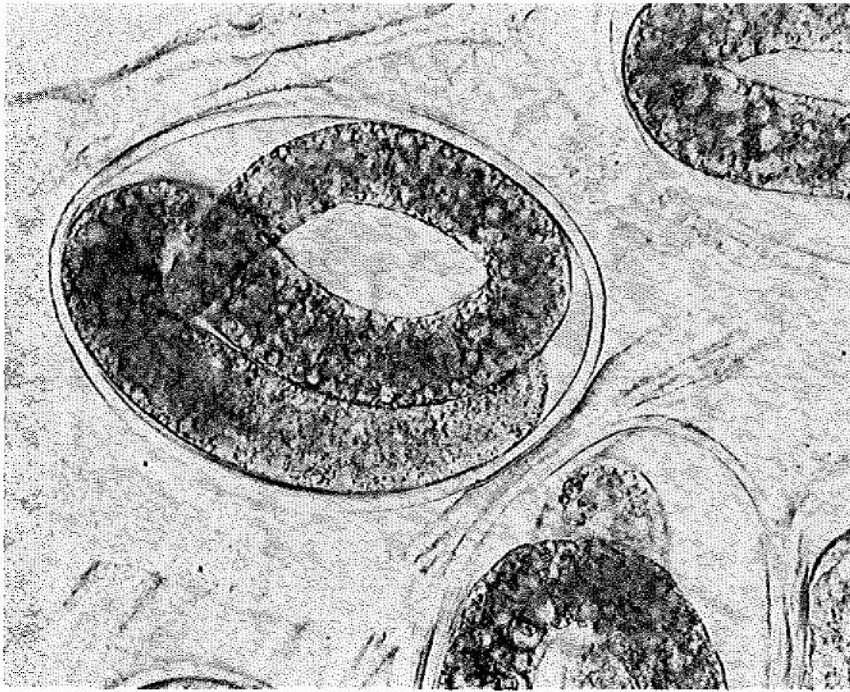


Figure 29.
Uncinaria lucasi
ova

(from Olson, O. W. and E. T. Lyons [1965], Journal of Parasitology,
Vol 51, p 689-700.)

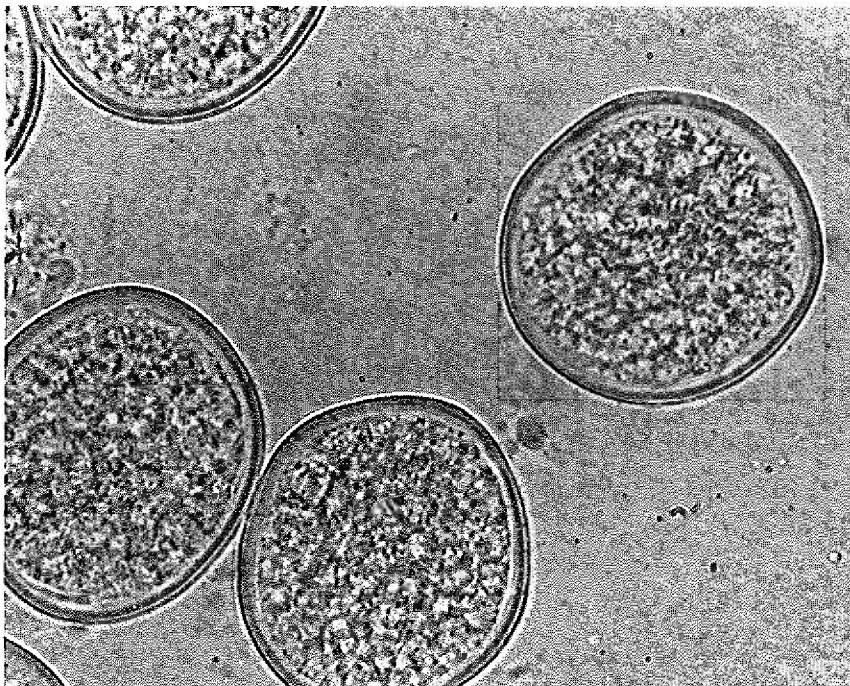


Figure 30.
Contracaecum sp.
ova

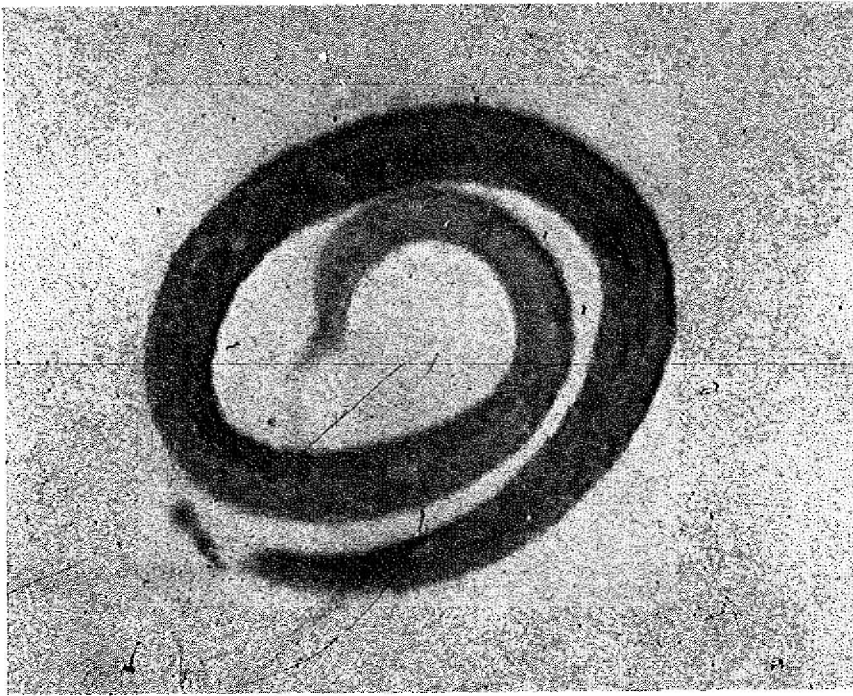


Figure 31.
Parafilaroides decorus
larva

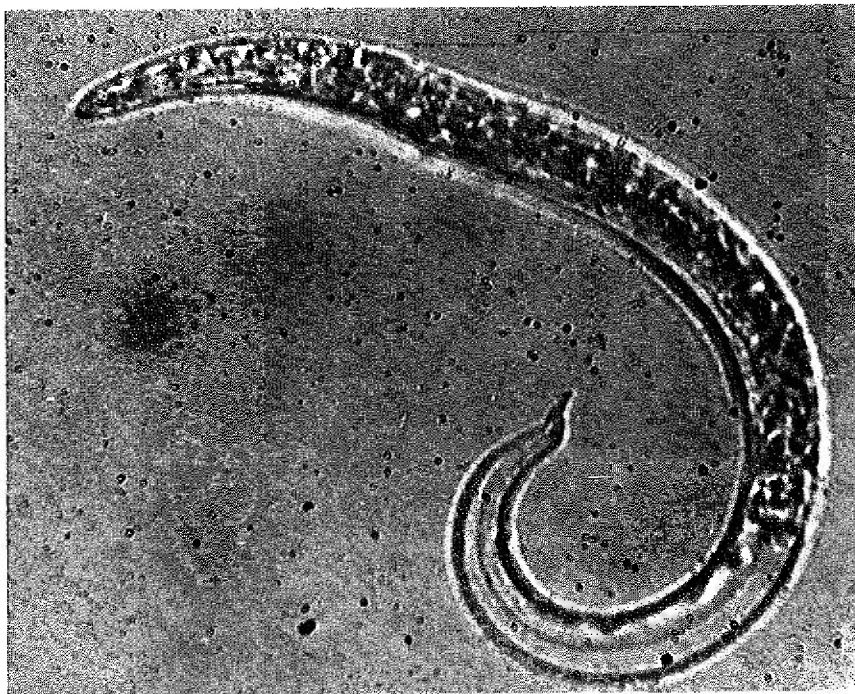


Figure 32.
Otostrongylus circumlitus
larva

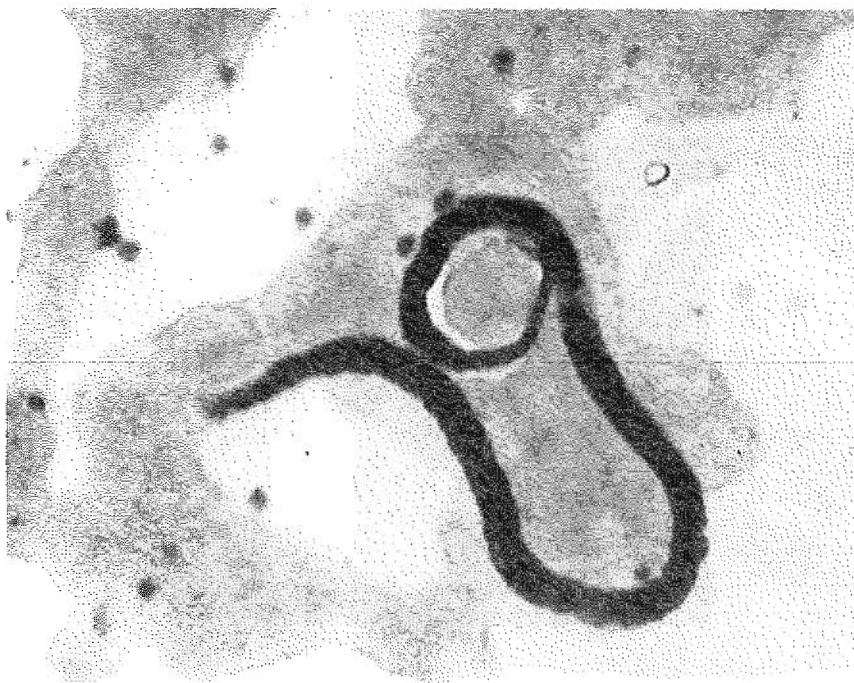


Figure 33.
Dipetalonema odendhali
larva

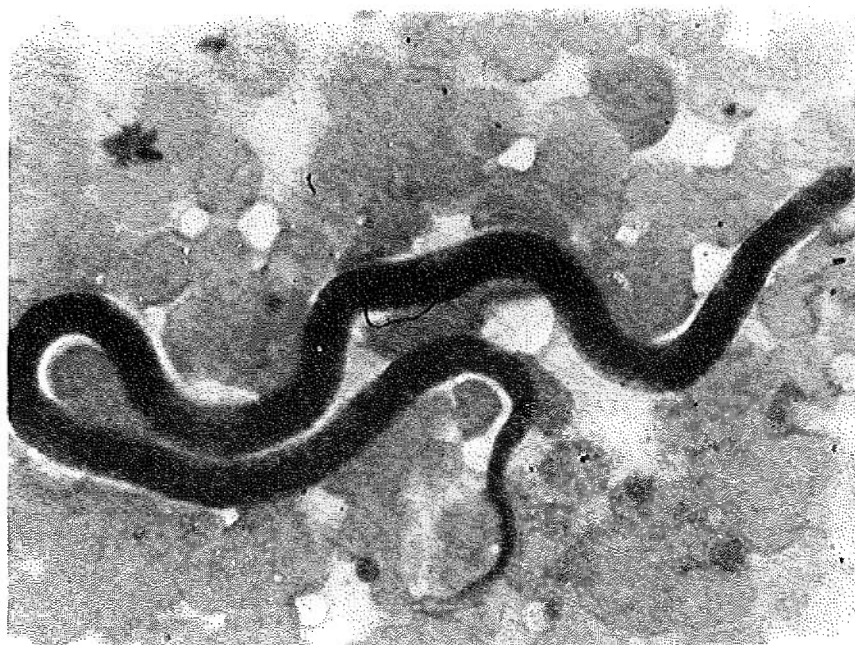


Figure 34.
Dirofilaria immitis
microfilaria



Figure 35.
Antarctophthirus
microchir

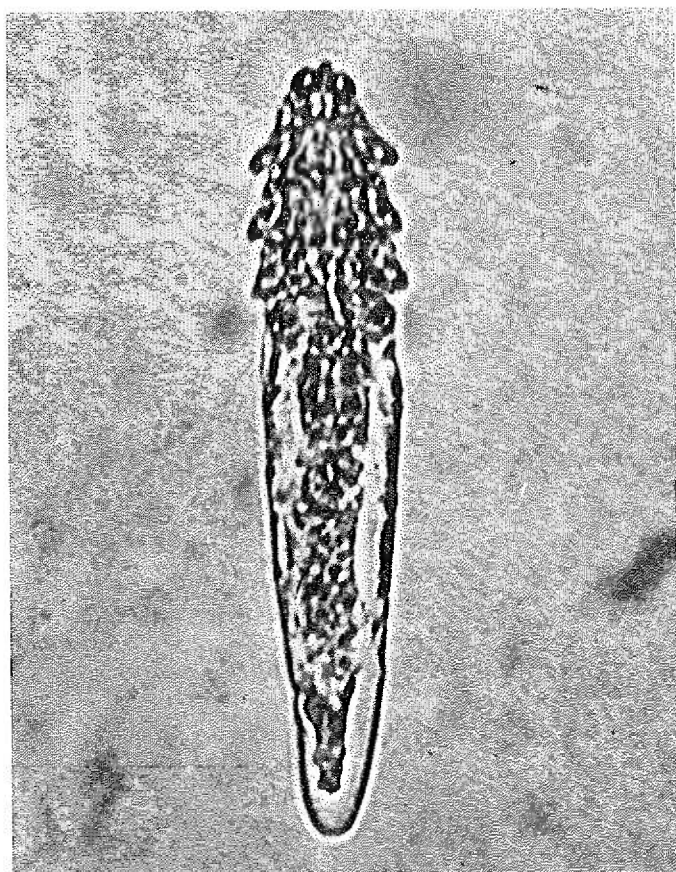


Figure 36.
Demodex zalophi

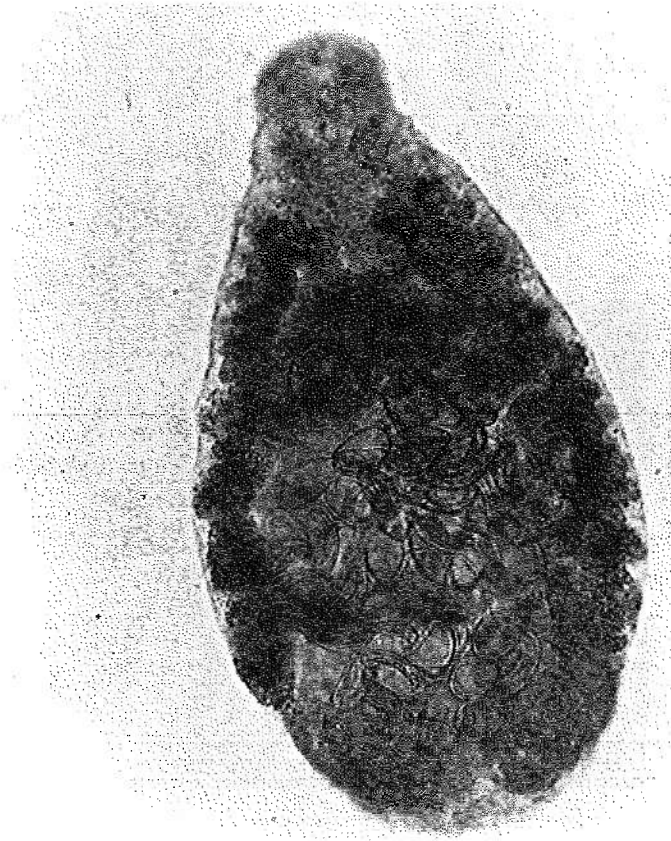


Figure 37.
Pricetrema zalophi



Figure 38.
Cryptocotyle sp.

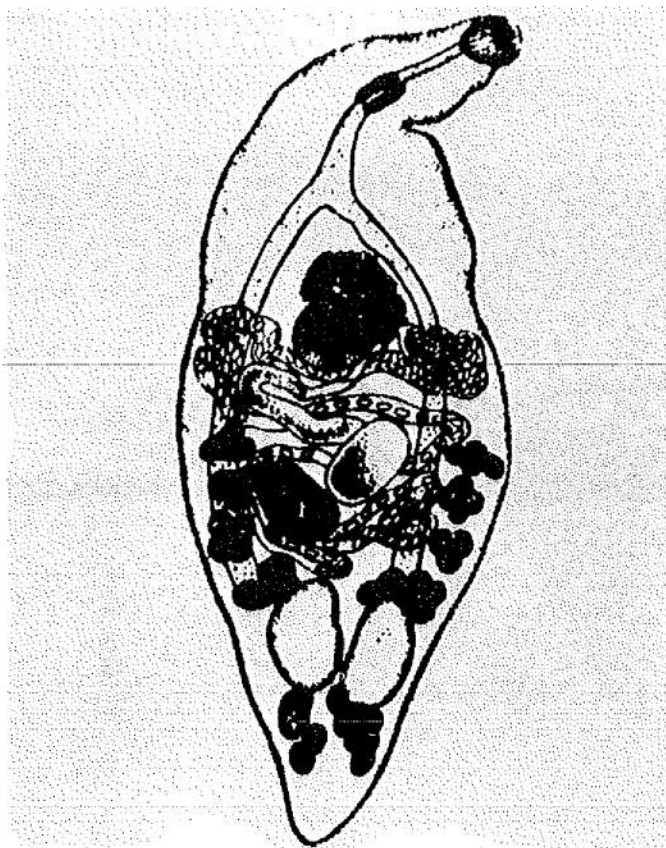


Figure 39.
Phocitrema fusiforme
(from Delyamure, 1955)

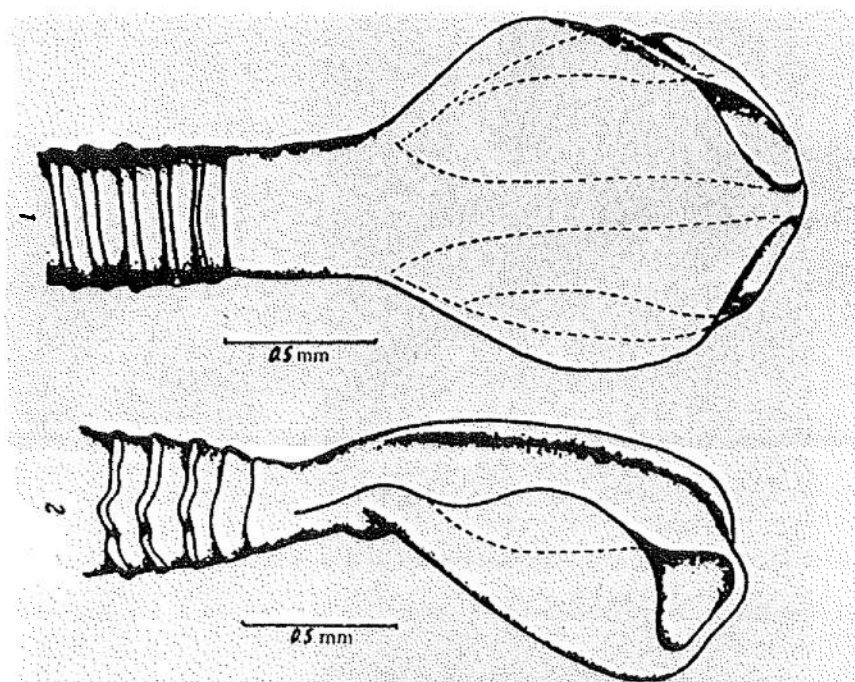


Figure 40a.
Diplogonoporus sp.
scolex
(from Delyamure, 1955)



Figure 40b.
Diplogonoporus sp.
segment
(from Delyamure, 1955)

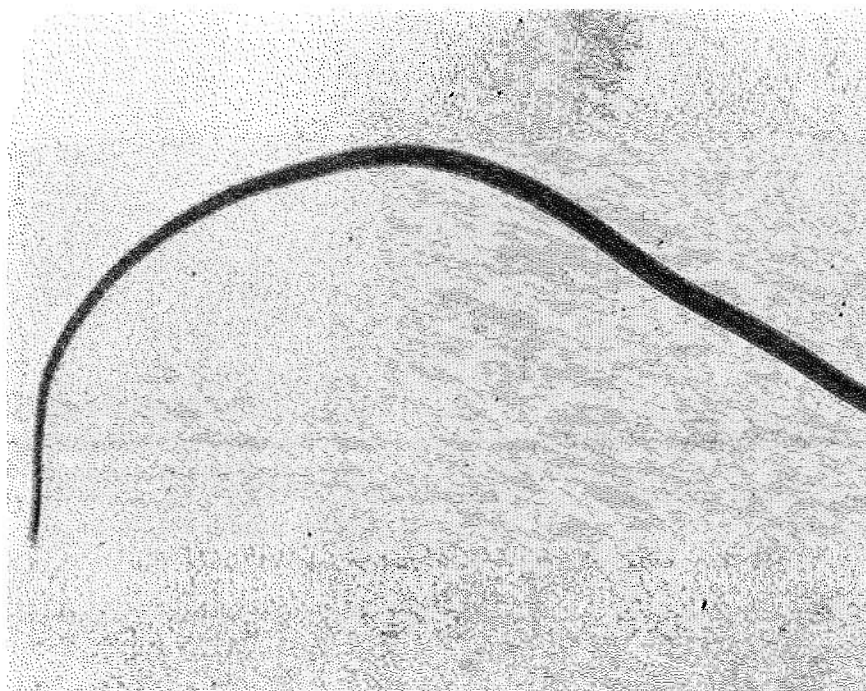


Figure 41.
Parafilaroides decorus

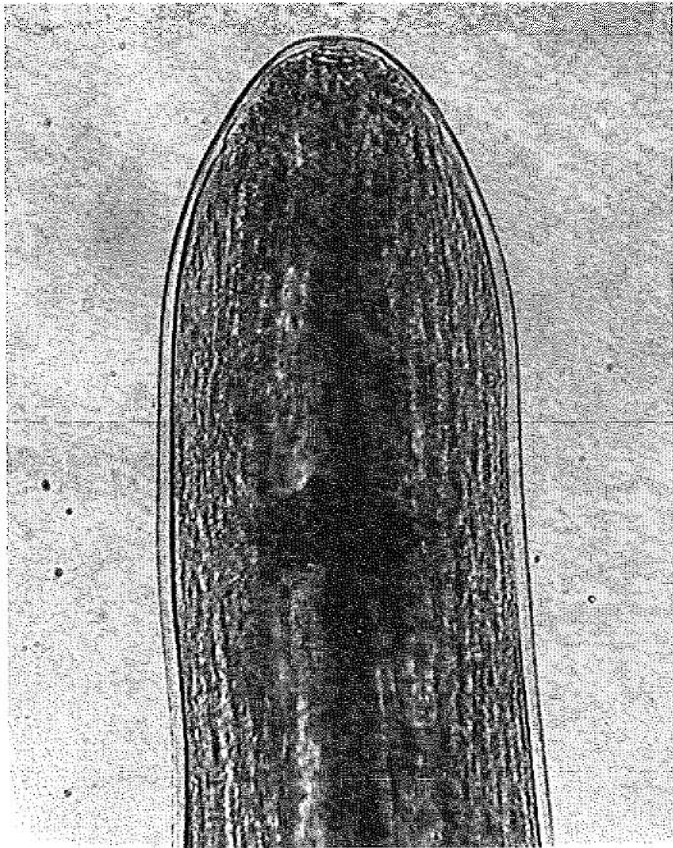


Figure 42a.
Dipetalonema odendhali
female anterior

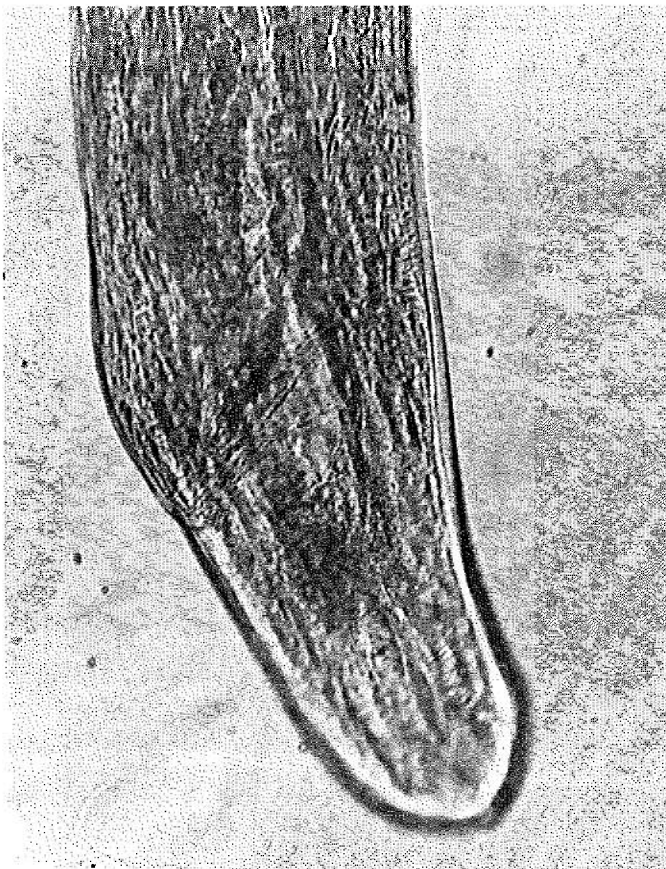


Figure 42b.
Dipetalonema odendhali
female posterior

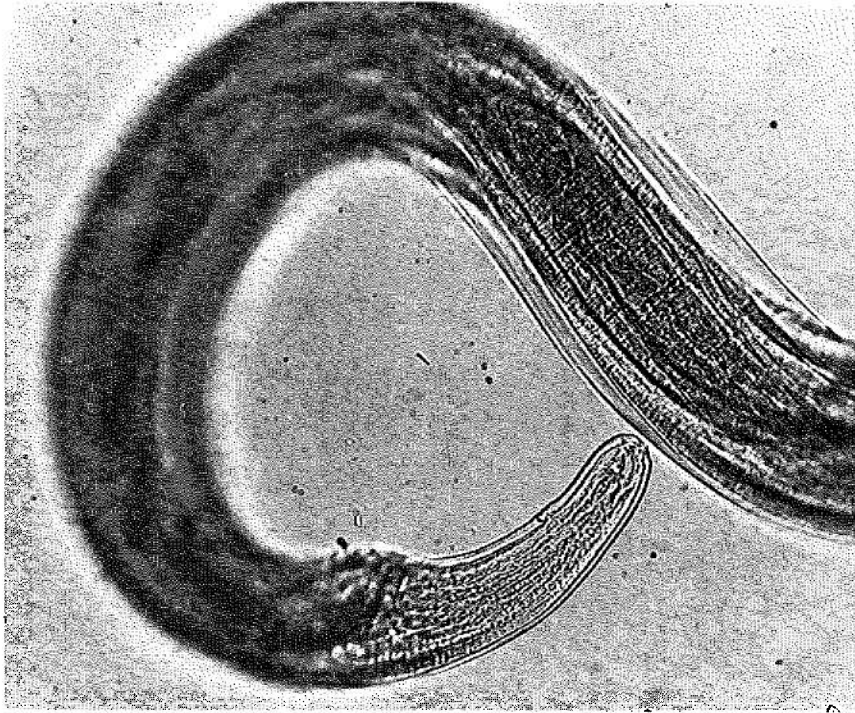


Figure 43.
Dipetalonema spirocauda
male posterior

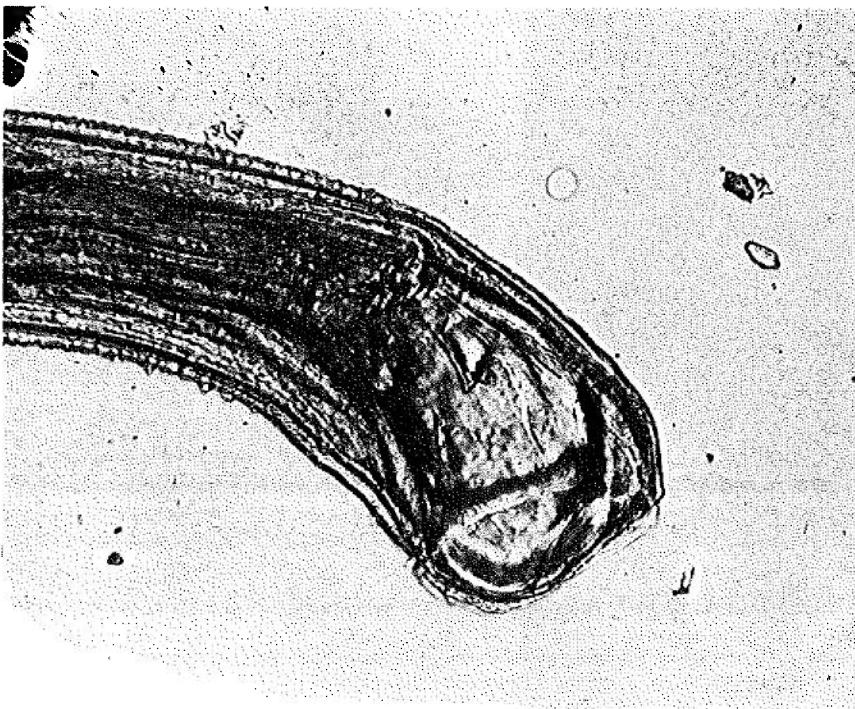


Figure 44.
Uncinaria lucasi

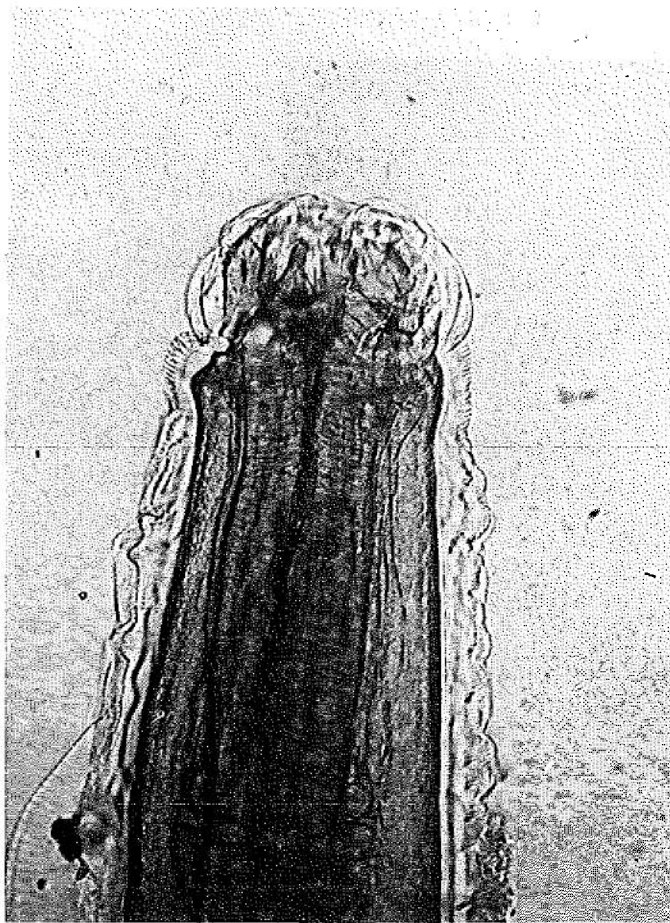


Figure 45a.
Contracaecum sp.
anterior

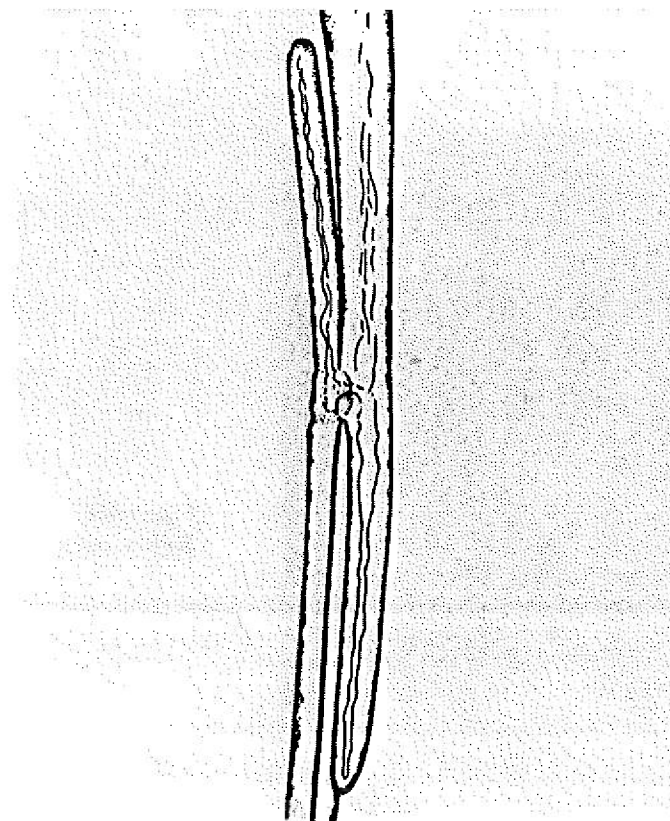


Figure 45b.
Contracaecum sp.
intestinal caeca
(from Delyamure, 1955)

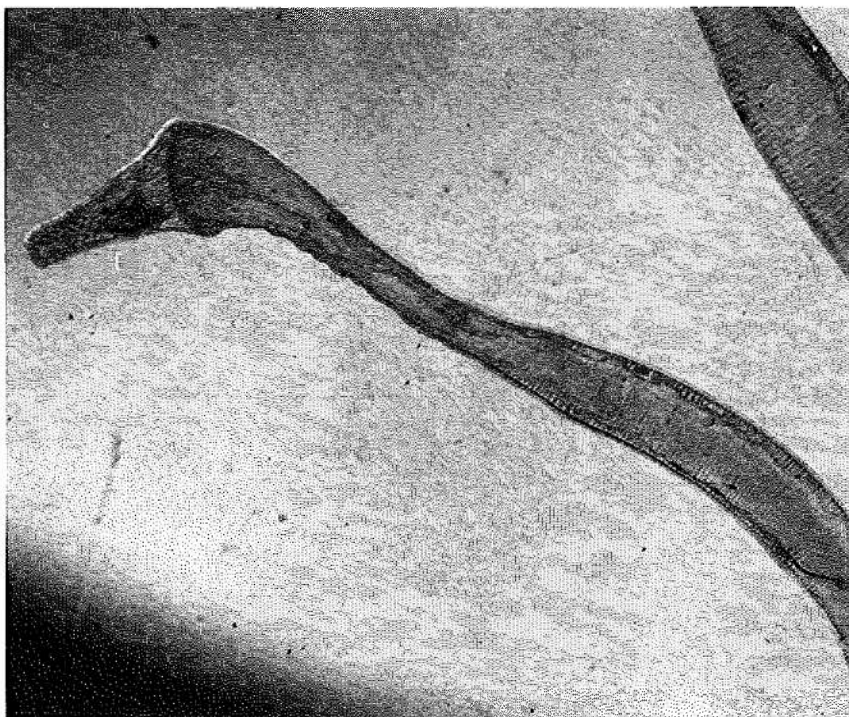


Figure 46a.
Bolbosoma sp.

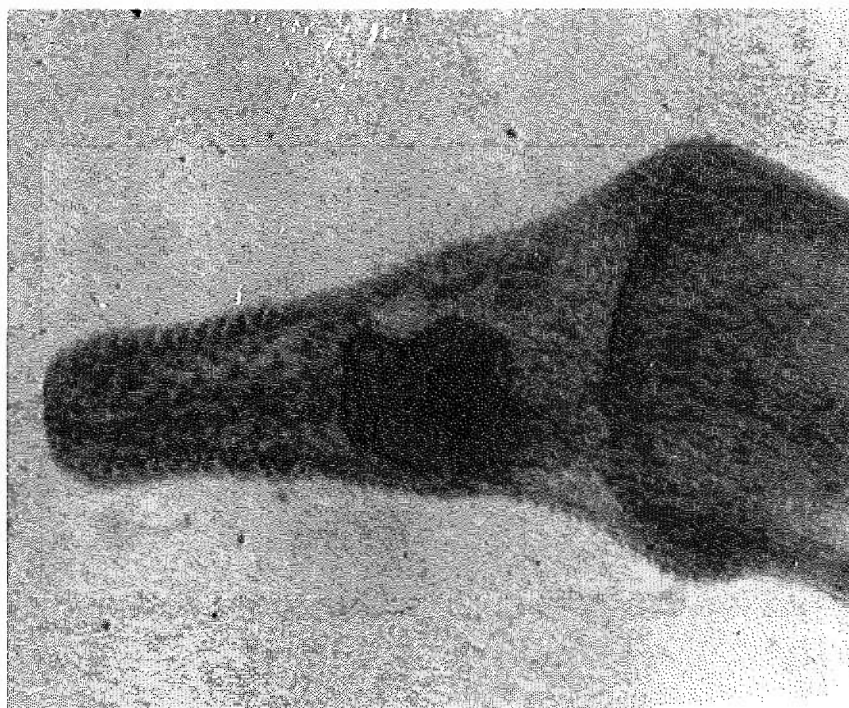


Figure 46b.
Bolbosoma sp.

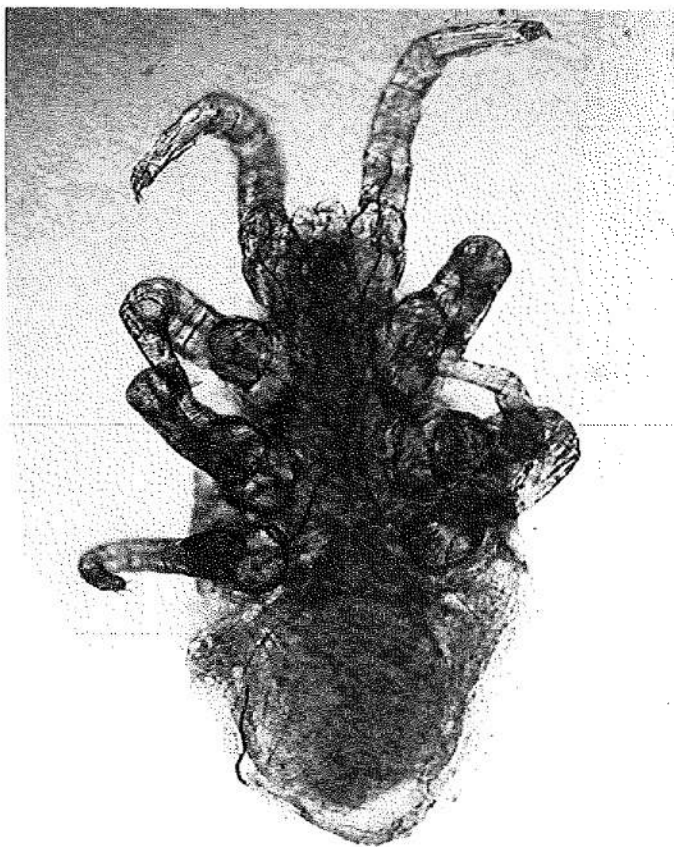


Figure 47.
Orthohalarachne
diminuata

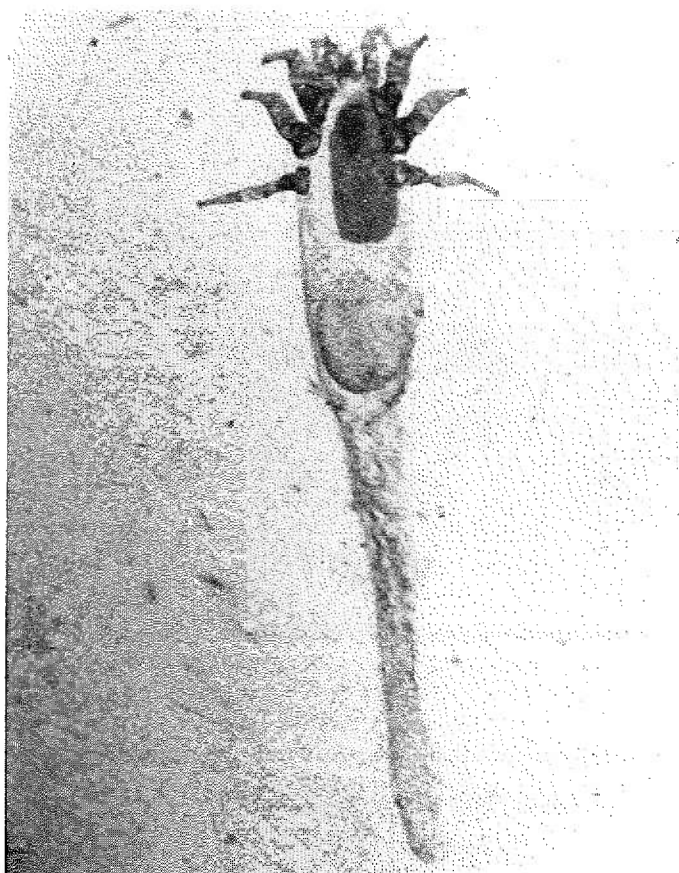


Figure 48.
Orthohalarachne
attenuata